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R E M A R K S

The application has been amended so as to place it in condition for allowance at the time of the next Official Action.

Claims 1-17 were previously pending. This amendment adds new claims 21-33.

The Official Action objected to the drawing figures 10-12 for not containing a prior art legend. Responsively, the drawings are proposed to be accordingly amended.

The drawings were also objected to for not including reference element 117 as indicated on page 9, lines 13-14 of the specification. The specification has been amended to overcome this requirement.

The Official Action objected to the Abstract. Responsively, a replacement Abstract which is believed to be in conformance with all formal requirements is provided on the attached separate sheet.

The Official Action objected to claim 1 due to an informality. Responsively, claim 1 has been amended.

The Official Action rejected claims 1-12, 14, 16, and 17 under § 102(e) as anticipated by DILL et al. 5,898,548.

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The Official Action rejected claims 13 and 15 under §103(a) as obvious over DILL et al.

Applicants have carefully studied the devices disclosed DILL et al. and do not find an anticipating device or disclosure. Accordingly, the anticipation rejections and the obviousness rejections are not believed viable.

Specifically, claim 1 recites that the first and second magnetic shields serve as electrodes so that currents flow in an almost vertical direction between the first and second magnetic shields. See lines 17-24 of claim 1.

With reference to Figure 3, the first and second magnetic shields are layers S1 and S2 which run horizontally and contact gap layers G1 and G2. The gap layers in turn run horizontally and contact the magneto-resistance ("MR") composite head. Accordingly, the magnetic shields do not come in direct contact with the MR head.

The relationship between the magnetic shields, or rather the lack of relationship, and the MR head can be seen more fully in Figure 4a. In Figure 4a, note that the magnetic shields are not shown but rather that the drawing begins with the two gap layers G1 and G2. Interior to these gap layers one finds electrodes 104 and 110. See the Specification at column 5, beginning at line 25 wherein it is disclosed that the MR read head includes a bottom electrical lead 102 formed on the gap layer G1 substrate and a top electrical lead 104 below the gap layer G2. In Figure 4a there is shown the

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current coming from the left on electrode 102 going through the MR head and exiting to the right via electrode 104. From this, applicants believe it is clear that the first and second magnetic shields do not serve as electrodes as recited in independent claim 1.

Applicants also believe that the recitations concerning the end regions arranged to sandwich the center region and apply a bias magnetic field to the center region are not anticipated.

The Official Action offers element 150 for this recitation. However, note that element 150, although being a biasing layer, does not meet the recitations of being arranged to sandwich the center region from both sides.

To clarify this particular recitation, claim 1 has been amended.

In view of the above differences noted between the recited invention and the applied reference, reconsideration and allowance of independent claim 1 as well as the claims depending therefrom are respectfully requested.

New independent claim 21 recites the invention in alternative claim language believed to be patentably distinct over DILL et al. Therefore, allowance of claim 21 is also requested.

New claims 22-33 recite that the center region comprises inclined end walls.

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The present invention enables one to apply a bias magnetic field to the TMR element and accordingly, enables one to obtain a high resolution, a high track density, and a reduced width of the track as is described in the specification, page 10, lines 10-12.

In contrast, DILL et al. disclose a tunnel-junction magneto-resistance effect had including magnetic shields serving also as electrodes, wherein a high surface density can be obtained by reducing a distance between the magnetic shields.

An advantage of the present invention is that it realizes a high resolution for realizing a high linear density and reduces the track width for realizing a high track density. On the other hand, the DILL et al. achieves a high surface density by reducing the distance between the magnetic shields.

The high surface density is obtained through a high linear density by providing a head having a high resolution in the linear density direction. That is, the present invention realizes a high linear density as well as a high density in the tack width direction, whereas DILL et al. provide no benefit on the high density in the tack width direction.

Thus, the structures of the present invention and DILL et al. are quite different. In the present invention, the magneto-resistance effect (hereinafter, referred to as MR) head includes the center region having inclined end surfaces

in the width direction, which are absent in DILL et al. By using the inclined surfaces, it is possible to easily form an accurate configuration of insulating the side surfaces of the TMR layered film and effectively apply a bias magnetic field. That is, by using the "inclined surfaces", the insulation film formed to cover the inclined surfaces need not have a large thickness for sufficiently insulating the TMR layered film and the permanent magnet layer.

Furthermore, since the insulation layer has a small thickness, the permanent magnet layer can be formed at an appropriate position on the insulation film with a high accuracy. The permanent magnet layer is used to apply a bias magnetic field to the TMR layered film. When this permanent magnet layer is arranged at an appropriate position with respect to the position of the TMR layered film, it is possible to effectively apply a bias magnetic field to the TMR layered film. Accordingly, even if the distance between the upper and the lower shield becomes small for a high linear density, and even if the track width, i.e., the patterning width of the TMR layered film becomes small for a high track density, the permanent magnet layer can be positioned with a high accuracy. Thus, the constituent features of the present invention advantageously realize a high linear density and a high track density.

Moreover, as is clear from Fig. 8 and Fig. 9 and specification, page 23, line 24 to page 24, line 20, and page

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35, line 26 to page 36, line 16, in the present invention, after the insulation layer is formed, the permanent magnet layer is formed directly on the insulation layer 107, which enables an accurate positioning of the permanent magnet layer. In contrast to this, DILL et al. do not disclose a specific method for forming the bias ferromagnetic layer (equivalent to the permanent magnet layer in the present invention). Fig. 4A of DILL et al. shows that the bias ferromagnetic layer is embedded in the insulation layer, which suggests to one of skill in the art that its production method is complicated and its positioning is not easy.

As has been described above, the "inclined surfaces" of the present invention has remarkable effects. It should be noted that the feature of the "the center region having the inclined surfaces in the thickness direction" is shown in Fig. 1 to Fig. 3, Fig. 5, Fig. 6, Fig. 8, and Fig. 9.

Moreover, specification page 23, line 24 to page 24, line 20 explains with reference to Fig. 8 the patterning process after the TMR film is layered according to the present invention. As is explained here, and as is clear for those skilled in the art, when a resist is formed and patterned by a ion beam, the end surfaces of the end region are inclined as shown in Fig. 8.

Furthermore, the specification at page 24 line 7 to line 10 describes that according to this method, the end surfaces formed during the TMR film patterning are covered by

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a non-magnetic insulation layer, after which the permanent magnet layer is formed. That is, the end surfaces are "covered". In order to "cover" the surfaces, the surfaces should be inclined. If the surfaces are not inclined, the insulation film cannot be deposited on the end surfaces. Moveover, this "inclination" enables one to obtain the effect "without short-circuiting between the two magnetic layers facing to each other via the tunnel barrier layer of the TMR film" (specification page 24, lines 10-14).

If the surfaces have no "inclination", avoiding short-circuit requires an insulation layer having a greater thickness. In this case, the permanent magnet layer to be formed following the insulation layer cannot be positioned at the right and left ends of the TMR layered film (viewed from the same viewpoint as in Fig. 1).

Thus, the bias magnetic field could not be applied correctly.

For these further reasons, the present invention, as recited by the present pending claims, is believed to be patentable.

Accordingly, allowance of all the pending claims is respectfully requested.

From the above, applicants believe that the present application is in condition for allowance and an early indication of the same is respectfully requested.

If the Examiner has any questions or requires clarification, the Examiner may contact the undersigned attorneys so that this application may continue to be expeditiously advanced.

Respectfully submitted,

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